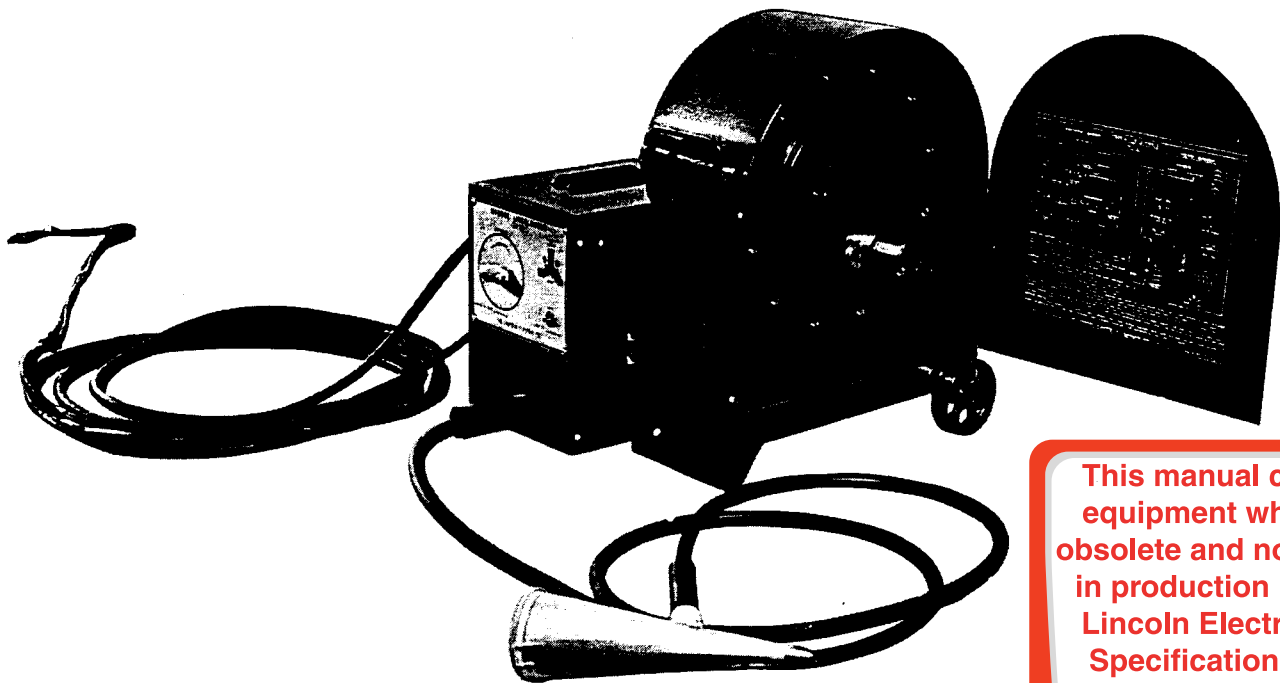


OPERATING MANUAL

Manual Lincolnweld®

ML-2 SQUIRT® WELDER



This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

LINCOLN ELECTRIC THE LINCOLN ELECTRIC COMPANY

World's Largest Manufacturer of Arc Welding Equipment and Electrodes • Manufacturer of Motors Since 1895

Cleveland, Ohio 44117 U.S.A.

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• Padstow, N.S.W., Australia

• Grand-Quevilly, 76—France

INSTALLATION

DAMAGE CLAIMS

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

POWER SOURCE

The ML-2 was designed specifically to be powered by the SAE-600 motor-generator or engine driven power source. Other variable voltage welders, such as the SA-750 and Idealarc, can also be used as ML-2 power sources.

The SA-750 does not have the dual continuous control feature of the SAE welders. Therefore, to permit easy adjustment of current and voltage, the ML-2 should be equipped with the optional meter kit when it is powered by an SA-750.

Idealarc transformer rectifier welders with a 450 amp or larger DC output can also be used as an ML-2 power source. However, an ML-2 Power Pack Kit must be installed on the Idealarc to provide the necessary voltage for the field of the wire feed motor.

When using a power source with a rating less than 500 amperes continuous duty, be careful not to exceed the power source duty cycle.

CONTROL AND ELECTRODE CABLE ASSEMBLY-

ML-2 TO POWER SOURCE

This cable assembly consists of a 2/0 electrode cable and a five conductor control cable. The control cable has a polarized plug at the ML-2 end and is lugged at the power source end. The control cable and electrode cable are properly connected to the ML-2 when shipped.

You must obtain another 2/0 cable of suitable length for a ground cable. The ground cable is not supplied as part of the ML-2 package. The control cable, electrode cable and the ground cable are connected as follows:

A. Control Cable

SAE-600 - Instructions for connecting the five conductor control cable to an SAE power source are given on diagram M-7232 located on page 18 in this manual and on the inside of the ML-2 wire reel case door.

The ML-2 can be used with later power sources than those listed above. Contact the factory for installation instructions.

SA-750 - See diagram M-8747 on page 19 of this manual for instructions for connecting the control cable to the SA-750.

When an ML-2 is installed for automatic operation with an SA-750 power source, a wiring change in the ML-2 control box is necessary if the off-inch switch is to be used to stop the arc at the end of the weld. To do this, open the ML-2 control box door. At the terminal strip, remove the lead #24 coming from the current relay. Tape the end of this lead. Do not remove the lead #24 going to the control cable connector. If the arc is to be stopped by raising the gun away from the weld, this rewiring is unnecessary.

Idealarc - Complete instructions for connecting an ML-2 to an Idealarc are given in the ML-2 Power Pack Kit instruction.

B. Electrode Cable

Connect the electrode cable to the 'Electrode' stud on the power source. With an SA-750, use the 'Minimum - 525' current range stud.

C. Ground Cable

Connect one end of the ground cable to the 'To Work' stud on the power source. Connect the other end of the ground cable to the work.

CONDUCTOR CABLE-

ML-2 TO GUN

The conductor cable carries the welding current and electrode from the ML-2 to the gun. Insert the male end of the conductor cable into the socket in the control case. Screw the sleeve tightly into the coupling.

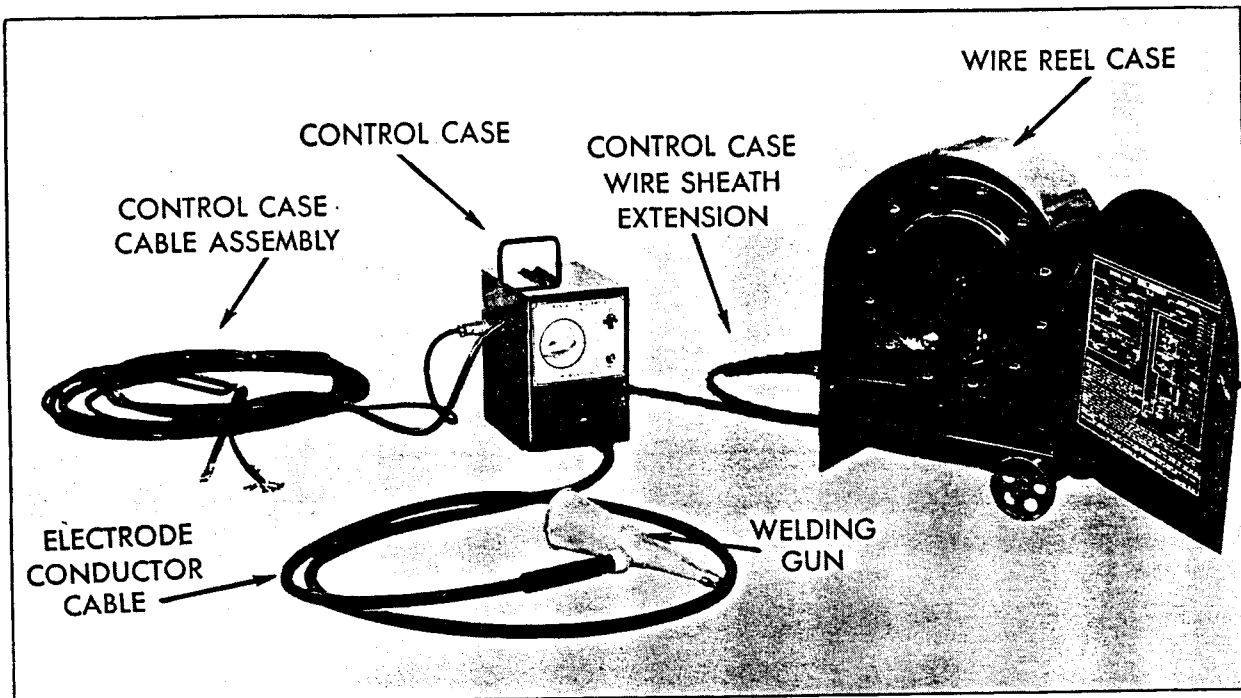
GUN

When shipped, the gun is ready to feed 5/64" electrode. If you must use 3/32" electrode for a particular application, replace the nozzle tip with Tip S-8087-6. These tips must be ordered separately.

CONTROL CABLE EXTENSION

(Optional)

The five conductor control cable extension is made in 50 foot lengths and has screw connectors at each end. It is connected between the standard 25 foot control cable and the control case. Use a maximum of four 50 foot extensions. The extra 2/0 electrode cable needed to carry the welding current is not included with the control cable extension.



WIRE SHEATH EXTENSION

(Optional)

When the ML-2 is shipped, the control case and wire reel case are bolted together. In some applications, it is more convenient to separate the two cases. When this is done, the wire sheath extension is necessary to carry the electrode from the wire reel case to the control case. This wire sheath extension is made in 15 foot lengths and has screw connectors at each end. Use a maximum of two 15 foot extensions.

METER KIT (Standard after June 1963)

The ML-2 meter kit includes an ammeter and a voltmeter. It is required for such applications as hardsurfacing and alloy welding where close current and voltage control is critical. It is easily bolted to the top of the control case. Installation instructions are included with the kit.

CONTINUOUS FLUX FEED KIT

(Optional)

Flux Tank

Place the flux tank near the ML-2 welder. Connect the input air hose to the street elbow at the side of the tank. A quick disconnect fitting should be installed between the elbow and the input hose.

Use the regular plant compressed air system provided the system pressure is between 60 and 120 psi. The flux tank is equipped with a pressure regulator to reduce the pressure to the 26 to 30 psi required for the flux feeding system. This regulator is set at the factory before shipping. The pressure is indicated on the pressure gage.

The air system is equipped with a water and dirt separator. Water separated from the input air feeds down through the long flux filled tube located at the input connection. It is exhausted through the coiled copper tube beneath the flux tank. There is always a small amount of air and possibly water coming out of the end of this tube.

Gun

Remove the standard ML-2 gun by loosening the knurled locking collar. Assemble the continuous flux feed kit gun to the end of the cable and tighten the locking collar. Connect the flux tube to the tank using the clamp taped to the end of the flux tube. If desired, tape the flux tube to the gun cable. Be careful not to deform the hose or the flux flow can be restricted.

With the air pressure on, flux flows when the gun is held in position for welding. To stop the flux flow, turn the gun up. An air relief valve is built into the gun to eliminate air blowing at the cone when welding.

CONTINUOUS FLUX FEED KIT

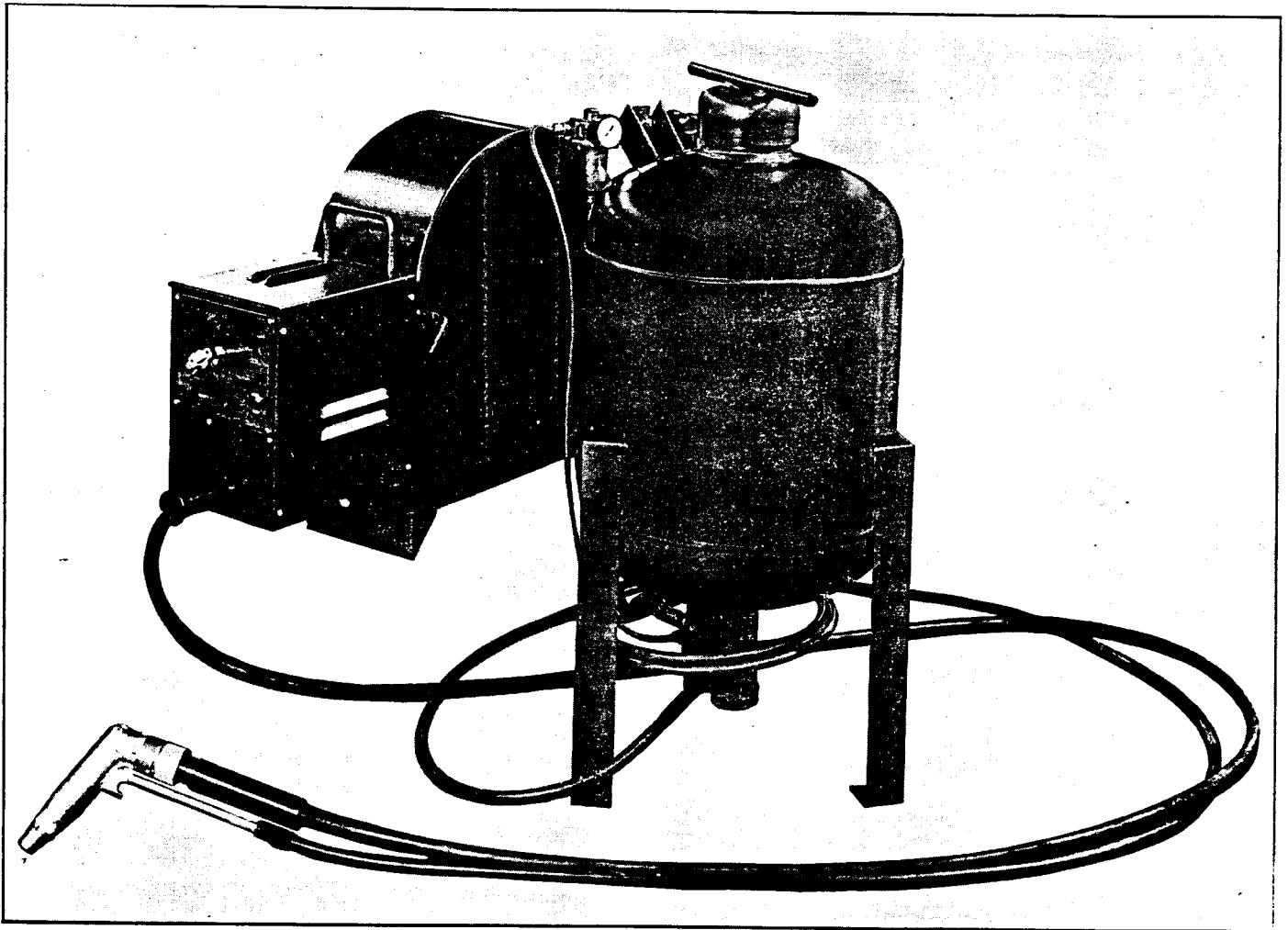
(Cont'd.)

Flux Tank Loading

Turn off or disconnect the input air line. Loosen the flux tank cover to permit the air pressure to escape. Open the tank. Using the funnel provided, fill the tank with 100 pounds of new or freshly screened flux. All reused flux must be screened 100% through a screen with 3/32 inch maximum

openings (8 Mesh). The screens in the funnel and in the tank filler neck are not sufficiently fine to protect the feeding system. Their purpose is to remove large pieces of paper torn from the flux bag or large pieces of solid flux that may have gotten into the flux after it was screened. Do not remove the screen from the filler neck. When the tank is full, replace the cover and reconnect the air line. Tighten the top only hand tight. More pressure reduces the life of the gasket.

NOTE: The 2 1/8" dirt trap tube is filled with flux when the machine is shipped. See page 10 for instructions for periodic cleaning this trap.



- The gun shown above is no longer available (see page 18).

OPERATING INSTRUCTIONS

ADJUSTING CURRENT AND VOLTAGE

Actual desired welding current and voltage recommended for various applications are listed in the procedure tables on pages 6 and 7. Adjustment of the current and voltage for the different power sources is as follows:

A. SAE-600

Current is set with the 'Continuous Current Control' on the SAE control box. Voltage is set with the 'Arc Volts' rheostat on the ML-2 control case. Recommended settings for these controls and for the 'Job Selector' on the SAE for various applications are given in the procedure tables.

The 'Job Selector' on the SAE is set to reduce the starting current. It does not affect the welding current or voltage. When the voltage builds up to welding voltage, the welding relay shorts the 'Job Selector' out to the circuit. This provides good starting with less danger of burning the nozzle tip.

B. SA-750, SA-800, SAF-600, etc.

These machines do not have a 'Continuous Current Control' reactor. Use the output stud with the lowest range that will provide the current required. The rheostat on the power source affects current and voltage. The 'Arc Volts' rheostat on the ML-2 affects welding voltage. Therefore, the optional meter kit on the ML-2 is helpful in setting the current and voltage.

C. Idealarc (See IM-201-A for installation)

Set the voltage with the 'Arc Volts' rheostat on the ML-2. Set the current with the Idealarc current control. The actual welding current will be a little lower than the reading on the Idealarc current dial.

ELECTRODE POLARITY

The electrode polarity is set with the power source polarity switch. Recommended polarity for different applications is listed in the procedure tables.

INCHING CONTROL

Turn the switch in the ML-2 control case to the 'Off-Inch' position. Operate the 'Inch' button to inch the electrode out. If at first the inching is slow, turn the switch to 'On-Weld' and back to 'Off-Inch'. The proper inching voltage should then develop. (Wait at least three seconds before operating the 'Inch' button after throwing the switch to 'Off-Inch' to avoid the possibility of burning the 'Inch' button.) The power source po-

larity switch must be set on DC+ or DC- to develop inching voltage. If, while inching, the electrode should touch ground, the wire automatically stops and the arc does not start.

When the ML-2 is connected to an Idealarc power source, the 'Inch' button is disconnected. With the switch in the 'Off-Inch' position the electrode will inch continuously. If the electrode touches ground, the arc will start.

LOADING THE CONE WITH FLUX

There are several ways of loading the gun with flux depending upon the application. The simplest method is to stop up the cone tip with a gloved hand or rest it in the flux in an insulated trough and fill the cone with a scoop. The cone holds about 2 3/4 pounds of flux. Close the cover and position the gun so the cone tip is upwards.

Time for loading the gun can be materially reduced by using a flux dispenser station. With this method, flux is dispensed into the gun from a flux holder above.



Figure 2

A simply constructed flux dispenser for use at a manual squirt welding station.

WIRE REEL LOADING

Remove the wire reel from the case. Remove the cover from the reel. Before cutting the tie wires place the coil of electrode on the reel so the electrode unwinds as the reel turns clockwise. Replace the reel cover and tighten securely.

Hold the end of the electrode tightly and cut and remove the tie wires. Insert the outside free end of the electrode into one of the three holes at the outer edge of the cover. Temporarily secure it by bending the end against the outer edge of the cover. Replace the loaded reel in the case.

NOTE: It is important that the free end of the electrode be securely held when the tie wires are cut and until the electrode is feeding through the drive rolls. Failure to do this will result in a back lashing of the coil which may tangle the wire and prevent proper unreeling.

While tightly holding the electrode cut off the bent end. Straighten the first four inches and insert it through the wire guide to the drive rolls. Inch the electrode through the guides into the conductor cable.

Inch the electrode about eight inches out of the gun end of the conductor cable. Thread the electrode into the gun by gripping the electrode with pliers about one-half inch from the gun and forcing it around the bend. Slip the gun and cable connections together and secure with the knurled lock nut. Tighten by hand.

STRIKING THE ARC

Be sure the conductor cable is free of kinks and small radius loops. To strike the arc, the electrode end must be sharp and clean and must stick out about 1/2" from the gun cone. Clip the end of the electrode after each weld to insure a sharp clean end.

The work at the point of striking must be clean and properly grounded. The SAE 'Job Selector' should be set as listed in the procedure tables.

Move the switch to the 'On-Weld' position. With the switch in this position, the electrode is electrically "hot" and ready to weld.

Position the gun approximately perpendicular to

the work. Allow a mound of flux about 1/2" high to form. To start the arc, touch the electrode to the work by scratching through the flux. It is important to scratch the electrode on the work rather than to poke the electrode to the work as is often done in hand welding.

MAKING THE WELD

Maintain the height of the gun above the work to allow sufficient flux depth to keep the arc from breaking through excessively. The wire is fed automatically maintaining a constant arc voltage. This voltage is independent of the height of the gun above the work.

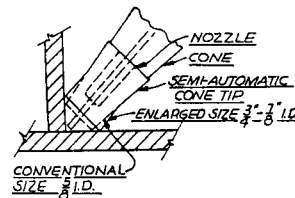
STOPPING THE WELD

To stop the weld, quickly lift the gun from the work simultaneously turning the gun upside down so the flux will stop flowing. Clip the end of the wire after each weld. Do not place the gun in such a position that the wire will touch ground while the switch is in the 'On-Weld' position.

CONE TIP RESIZING

When using a drag technique on fillet welds, it is often desirable to have a larger opening in the copper cone tip to provide a greater flux flow. The larger opening also keeps the nozzle a greater distance from the molten metal.

To enlarge the opening, hammer a tapered plug or a 3/4" steel ball through the cone opening.



Two sizes of flux cones are available for the optional continuous flux feed gun. See the parts list.

WELDING PROCEDURES

GENERAL

The speeds in these procedures are for arc time only. They apply to clean joints properly fitted or backed up.

When using an ML-2, the actual welding current is slightly greater than the current indicated by the yellow arrow on the SAE 'Current Control'.

The 'Arc Volts' settings are approximate. They must be adjusted for proper job operation. The arc voltage should be as low as the bead shape permits. Excessive arc break through with nor-

mal gun height indicates the arc voltage setting is too high. Bead width increases with increased voltage setting. Caution: Excessive voltage and slow speed produce welds with excellent appearance, but such welds may be prone to cracking.

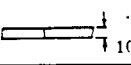
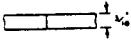
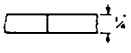
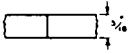
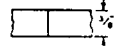
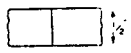
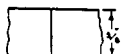

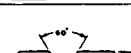

The procedures in the following tables are for 5/64" electrode. When using 3/32" electrode, the bead will have less penetration and will be wider.

If deeper penetration is required, the current should be increased. To increase the size of the weld bead, decrease the travel speed.

BUTT WELDS

Butt Welds are generally best accomplished by holding the gun approximately perpendicular to the seam and leaning the top approximately 10-15° forward in the

direction of welding. A small rotary motion is sometimes beneficial in order to increase bead width especially when using high current values. Bead width increases with increased voltage setting. *Maximum penetration* is directly *in line* with the wire.

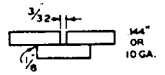
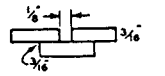
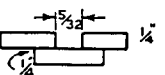
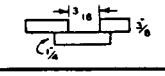
PLATE THICKNESS AND PREPARATION	PASS NO.	WELDER CONTROL BOX SETTING			ML-2 CONTROL BOX SETTING			ARC TIMING INCHES PER MINUTE
		APPROX. CURRENT CONTROL SETTING YELLOW ARROW	JOB SELECTOR	POLARITY	APPROX. ARC VOLTS DIAL NUMBER	Actual Desired Meter Readings		
						AMPS.	ARC VOLTS	
	1	245	Middle of Red	Negative	9-7	290	31	40-48
	2	300	"	"	9-7	330	33	40-48
	1	300	"	"	8-6	340	32	32-36
	2	300	"	Positive	10-8	340	32	32-36
	1	300	"	"	10-8	330	32	30-34
	2	360	Mid. of Spec. App.	"	8-6	415	32	30-34
	1	350	"	"	8-6	400	32	26-28
	2	400	"	"	7-5	490	33	26-28
	1	375	"	"	7-5	460	32	22-24
	2	400	"	"	7-5	490	33	22-24
	1	400	"	"	7-5	490	33	20-22
	2	450	"	"	7-5	540	35	20-22
	1	450	"	"	7-5	540	35	17-20
	2	450	"	"	7-5	540	35	17-20
	1	475	"	"	6-4	570	35	14-16
	2	500	"	"	5-3	590	35	14-16
	1	550	"	"	5-3	600	37	9-11
	2	550	"	"	5-3	600	37	9-11
	Multiple	330-350	"	"	6-8	350-400	32-34	10-20
	Seal Bead Procedure	260	Middle of Red	Negative	9-7	275	32	36-48

NOTE 1: If build up is excessive it is recommended to remove corners $\frac{1}{8}$ " x 45°. Place ground connection on start of the plate and weld away from the ground.

NOTE 2: Arc timing should be adjusted to width of groove and desired width of bead. Bottom beads in a narrow groove require a higher arc travel speed. As soon as groove becomes wide enough, split passes which do not completely bridge the groove should be used to facilitate slag removal.

BUTT WELDS INTO STEEL BACKING STRIP

Position gun approximately perpendicular to the seam leaning the top approximately 10-15° forward in the direction of travel. *Maximum penetration* is directly *in line* with the wire.

PLATE THICKNESS AND PREPARATION	PASS NO.	WELDER CONTROL BOX SETTING			ML-2 CONTROL BOX SETTING			ARC TIMING INCHES PER MINUTE
		APPROX. CURRENT CONTROL SETTING YELLOW ARROW	JOB SELECTOR	POLARITY	APPROX. ARC VOLTS DIAL NUMBER	Actual Desired Meter Readings		
						AMPS.	ARC VOLTS	
	1	325	Middle of Red	Positive	7-5	375	29	28-30
	1	375	Mid. of Spec. App.	"	6-4	470	31	22-24
	1	400	"	"	5-3	500	32	16-18
	1	450	"	"	4-2	550	32	14-16









FILLET WELDS

Position gun for horizontal fillet welding approximately 40° from the vertical plate, leaning the top forward approximately 10-15° in the direction of welding. While uniformly moving along use a small rotary motion for obtaining desired width of weld. On small fillets the drag technique may be used to advantage. Position the end of the gun into the corner and move along uniformly while

lightly touching and guiding gun tip from the horizontal and vertical plates. By increasing the copper cone tip I.D. slightly, larger fillets may be made using the drag technique.

Size of bead is best judged by watching height of molten flux along vertical plate.

Maximum penetration is directly *in line* with the wire. Polarity electrode negative.

Plate Thickness and Preparation	Pass No.	Leg Size	WELDER CONTROL BOX SETTING		ML-2 CONTROL BOX SETTING			Arc Timing Inches Per Minute
			Approx. Current Control Setting Yellow Arrow	Job Selector	Approx. Arc Volts Dial Number	Actual Desired Meter Reading		
						Amps	Arc Volts	
 .144" OR 10 GA.	1	5/32	275	Middle of Red	8-6	290	31	30-36
 3/16"	1	5/32	275	"	8-6	290	37	30-36
 1/8"	1	3/16	350	Mid. of Spec. App.	7-5	300	33	26-30
 3/16"	1	1/4	400	"	6-4	380	35	20-26
 1/4"	1	5/16	400	"	6-4	400	35	16-19
 3/8"	1	5/8	425	"	5-3	490	35	17-19 per pass
	2		425	"	5-3	490	35	
	3		425	"	5-3	490	35	
 1/2"	1	1/2	450	"	5-3	520	39	9-11
 3/4"	1	5/8	500	"	5-3	560	41	14-16 per pass
	2		500	"	5-3	560	41	

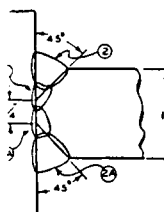
TEE WELDS

Position gun approximately 5° from the vertical plate leaning the top forward approximately 10 or 15° in the direction of welding. Very often it is beneficial to guide the gun by lightly touching the tip against the vertical plate. *Maximum penetration* is directly *in line* with the wire. Polarity, electrode positive.

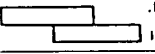
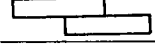
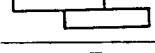
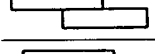
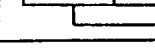
LAP WELDS

Position gun for lap welding approximately 15° from vertical pointing electrode into corner of the lap. Position top of the gun forward approximately 10 or 15° in direction of welding.

Maximum penetration is directly *in line* with the wire. Polarity, electrode negative.

PLATE THICKNESS AND PREPARATION	Pass No.	Leg Size	WELDER CONTROL BOX SETTING		ML-2 Control Box Setting		Arc Timing Inches Per Minute	
			Approx. Current Control Yellow Arrow	Job Selector	App. Arc Volts Dial No.	Actual Desired Meter Reading		
						Amps		Arc Volts
	1	5/8	475	Mid. of Spec. App.	5-3	590	34	9-10
	2		600	"	6-4	610	40	10-11
	1A	5/8	475	"	5-3	590	34	9-10
	2A		600	"	6-4	610	40	10-11

This weld will produce approximately 100% penetration. For pass 2 and 2A the work should be positioned in order to produce desired bead shape.

Plate Thickness and Preparation	Pass No.	WELDER CONTROL BOX SETTING		ML-2 CONTROL BOX SETTING		Arc Timing Inches Per Minute	
		Approx. Current Control Setting Yellow Arrow	Job Selector	Approx. Arc Volts Dial Number	Actual Desired Meter Readings		
					Amps		Arc Volts
 .144" OR 10GA.	1	350	Mid. of Spec. App.	8-6	360	37	40-46
 3/16"	1	380	"	7-5	435	36	30-36
 1/4"	1	425	"	5-3	490	35	20-26
 5/16"	1	425	"	5-3	490	35	18-24
 3/8"	1	425	"	5-3	490	35	15-20

*More uniform welds result by positioning plates approximately 15-30° from horizontal.

MAINTENANCE INSTRUCTIONS

EVERY WEEK

Detach the conductor cable from the case and lay it out straight on the floor. Remove the gun and gently blow out the cable from the gun end.

If the inside of the cable appears dry on the control case end, put in two or three drops of "Pyroil B" lubricant. Too much lubricant will cause dirt to collect in cable.

Open the door on the bottom of the control case and blow out all chips and dirt from the bottom of the case.

EVERY SIX MONTHS

Remove the top cover from the control case (#91, Parts List P-47-C) and gently blow out all the dirt. Remove the gear case cover (#100, Parts List P-47-E) and apply a graphite grease to the gears.

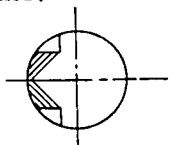
The incoming and outgoing wire guides (#34 and 40, figure 3) may accumulate grit, dirt or wire shavings. They should be removed and cleaned thoroughly using solvent if necessary.

To avoid shaving of wire, make sure that these wire guides are mounted in correct alignment, especially if they have been removed for cleaning.

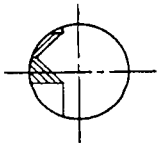
ALIGNMENT OF WIRE GUIDE ASSEMBLY

FOR ALL MACHINES EXCEPT THOSE WITH CODE NUMBER 1758.

1. Tighten the two cap screws (#50, figure 3) holding the wire guide assembly.
2. Hold a light inside the wire reel case so that the beam is directed into the incoming wire guide (#34). Now look into the outgoing wire guide (#40). Correctly-aligned guides and rolls should look like this:



3. If the drive rolls appear off-center in the tube like this:



You should either add or remove one of the thin metal shims (Part #T-9405) located just behind the drive roll assembly.

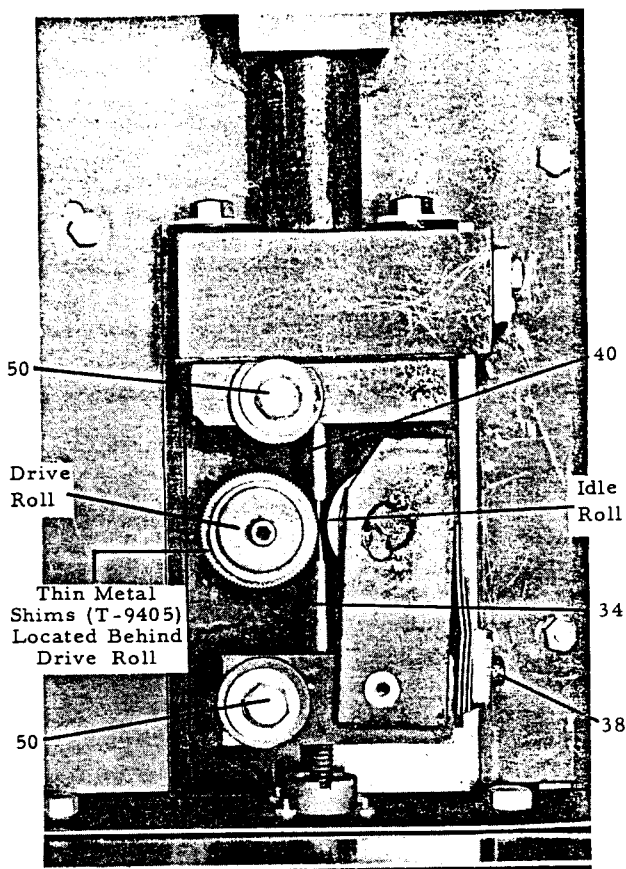


Figure 3

FOR MACHINES BEARING CODE NUMBER 1758

1. Release the spring tension on idle roll by loosening socket head screw (#38, figure 3).
2. Loosen the two cap screws (#50) which secure the guide block assembly.
3. Insert a straight piece of 3/32" wire in the guides. Tap the guide block assembly lightly until the wire is straight and centered.
4. Remove the wire and hold a light inside the wire reel case so that the beam is directed into the incoming wire guide (#34). Now follow the instructions under paragraphs two and three in the section just above.
5. After the block is lined up, tighten the two cap screws (#50) securely.
6. Tighten the idle roll socket head screw (#38) securely.

CABLE MAINTENANCE

Using rusty wire may clog the cable with rust and steel chips, eventually stopping the welding oper-

ation. If this should happen, remove the gun. Cut the wire as it leaves the reel and simultaneously pull and inch wire out of the cable. If a new, clean wire can not be fed through the cable, follow these instructions:

1. Stretch the cable out straight on the floor.
2. Locate the clogged spot and mark it on outside of cable.
3. Cut a piece of 1/8" mild or spring steel wire approximately 6" longer than is required to reach the clogged section.
4. Grind one end of the wire to a chisel point.
5. Insert the other end of the wire into the chuck of a hand drill.
6. Operate the drill, pushing the wire in and out of the cable while lightly tapping the clogged cable section until the wire clears the obstruction.
7. Clear the foreign material from the cable by gently blowing air through one end and then the other, while flexing the cable.

Keep the cable clean and free from kinks. If the inside of the cable appears dry on the control case end, put in two or three drops of "Pyroil B" lubricant.

GUN MAINTENANCE

Should the welding wire fuse to the end of the gun nozzle, use the following procedure:

1. Unscrew knurled locking ring from the locking collar and remove the gun by inching electrode and pulling gun from cable.
2. Clip the wire.
3. Remove the flux cone tip.
4. File or lightly grind the fused electrode so you can force it out by gently tapping the electrode at the connector end.

5. Redrill the nozzle tip (#10), using a #36 drill for a 3/32" #6 tip, or a #40 drill for a 5/64" #5 tip. Replace nozzle tip.
6. Replace the cone tip.
7. Re-attach gun to cable.

SERIES RELAY MAINTENANCE

Important: Do not attempt to adjust this relay (#70, Parts List P-47-C). Refer any trouble to the nearest Lincoln office or Lincoln Field Service Shop.

CONTINUOUS FLUX FEED KIT

Gun

See "Gun Maintenance" above.

Flux Feeding System

The only regular maintenance required on the flux feeding system is cleaning the water and dirt trap. Do this every six months or whenever air no longer escapes from the coiled copper tube located beneath the flux tank.

Remove the coiled copper tube from the bottom of the trap tube. Saw about 3/8 inch off the pinched end. Wash all the material out of the copper tube. Squeeze the end of the tube closed again. Maximum gap should be less than 0.010 inch.

Loosen the collar of the 2 1/8 inch steel trap tube. Remove the trap tube from the machine and wash it out completely. Fit the steel trap back into its bracket and attach the coiled copper tube to the bottom. Fill the trap to within 2 inches of the top with any clean flux.

Raise the trap tube into place and tighten the collar. When the air pressure is turned on again, part of the flux is forced into the coiled copper tube. Be certain a small amount of air is escaping from the end of the copper tube.

If the flux feeding system becomes plugged, see the Trouble Shooting section.

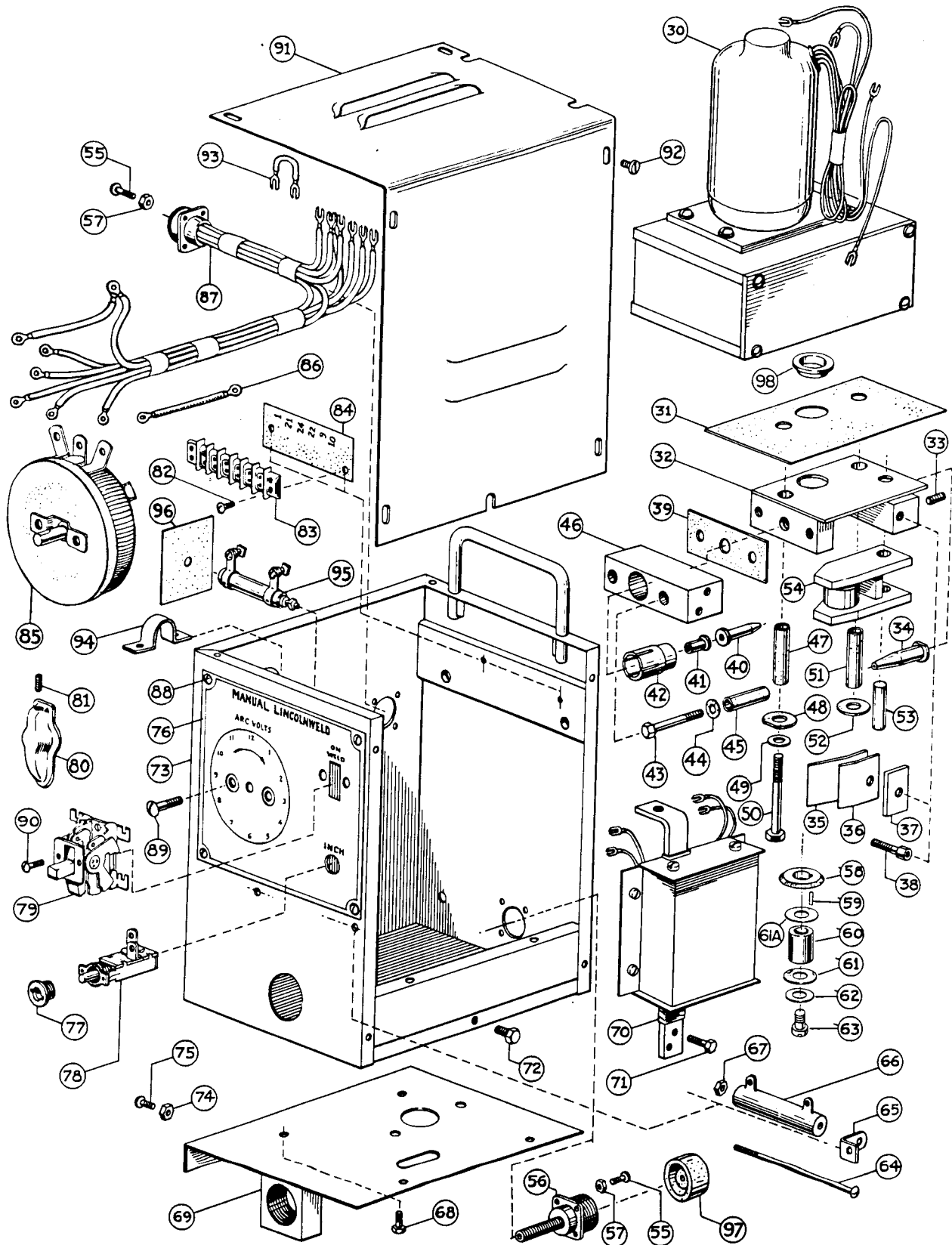
TROUBLE SHOOTING

TROUBLE	REMEDY
1. Electrode fuses to the nozzle tip.	a. Be sure you have a clean sharp point before striking the arc. b. On starting the arc scratch the electrode to the work. Do not jab as is sometimes done in conventional hand welding. c. Be sure you have a good ground to the work.
2. Welding satisfactorily and arc suddenly goes out.	a. Check the reel for tangled wire. b. Electrode may be jammed in the cable. See "Cable Maintenance" on the previous page. c. Check the wire feed rolls for wear.
3. You get the sensation that the electrode is pushing against the work raising the gun. The current also seems to change during welding.	a. Check for a low arc voltage or low current setting. b. Check for excessive friction in the cable.
4. ML-2 control case becomes electrically "hot".	a. Check for metal chips in the wire feed mechanism bridging the insulation.
5. Get small flash but no continued arc upon striking.	a. Be sure the switch is ON-Weld. b. Be sure the power source polarity switch is not on Off. c. Arc Volts may be set too low. d. The generator field may be open. e. Check the wire feed circuit. f. See trouble 2 above.

THE FOLLOWING TROUBLES APPLY TO THE CONTINUOUS FLUX FEED KIT

6. Flux stoppage not in the gun. (Be sure there are no kinks or collapsing of the hose.)	a. Check for a piece of slag in the hose by working back along the hose until flux can be felt. Shake the hose and feel for slag at this point. Blow out the hose with air if necessary. b. If there is no flux in the hose, check the flux tank outlet for a large piece of paper or slag. c. Be sure the flux tank pressure regulator is set for 28-30 lbs/sq. inch.
7. Excessive air blow and uneven flux flow from the gun.	a. Be sure the tank is full. It may look like the tank is full at the sides, but it will be down to the bottom in the center. b. If flux falls away from the weld faster than it is being fed, change the procedures of build a flux dam. c. Be sure the flux tank pressure regulator is not set over 28 - 30 lbs/sq. in.
8. Flux in the tank gets wet.	a. If there is too much water in the air line, too much water goes into the tank water disposal system and overflows into the tank. It is possible to get this much water from the air lines when first starting in the morning. Blow out the air lines before connecting them to the tank. b. Be certain a slight amount of air is escaping from the crimped end of the coiled copper bleeder tube under the flux tank.

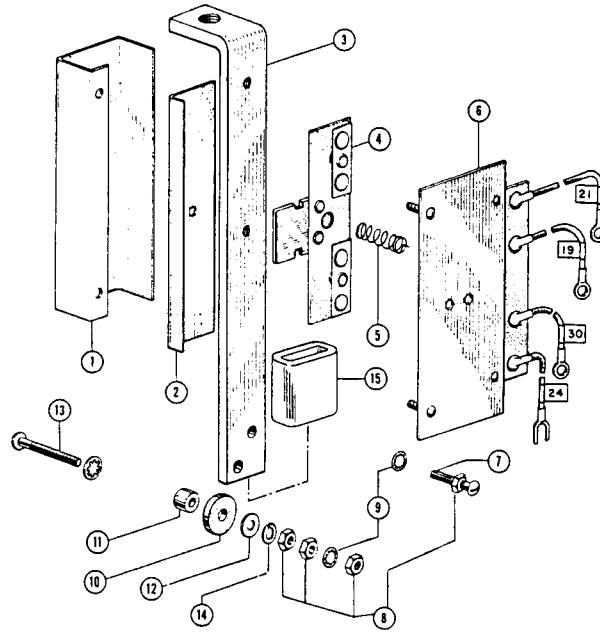
CONTROL CASE AND WIRE DRIVE ASSEMBLY



ITEM	PART NAME AND DESCRIPTION	PART NO.	NO. REQ'D.	1	2	3	4	5	6	7	8	9	10	11	12
	COMPLETE CONTROL CASE ASSEMBLY, includes all below	A-283	1												
30	Motor and Gear Case Assembly Motor and Gear Case Parts	G-962 See P-47-E	1												
31	Insulating Separator	S-8526	1												
32	Guide Block Assembly	M-6966	1												
33	Socket Hd., Cup Point Set Screw	S-11604-1	1												
34	Incoming Wire Guide	T-9366	1												
35	Idle Roll Spring	T-8750	2												
36	Idle Roll Spring	T-8751	1												
37	Idle Roll Spring Backing	T-8861	1												
38	Socket Hd. Screw	T-9447-13	1												
39	Block Insulator	T-9435	1												
40	Outgoing Wire Guide	T-9369	1												
41	Outgoing Insulating Guide	T-9365	1												
43	Hex Hd. Screw	3/8-16x2-1/2"	2												
44	Insulating Washer	S-10773-19	2												
	Plain Washer	S-9262-4	2												
45	Insulating Tube	T-7305-6	2												
46	Outgoing Guide Block	S-9847	1												
42	Block Connector	S-7969	1												
47	Insulating Tube (1 15/32" long)	T-7305-7	1												
48	Insulating Washer	T-9407	1												
49	Plain Washer	S-9262-4	2												
50	Hex Hd. Screw	3/8-16x2-1/2"	2												
51	Insulating Tube (1 9/16" long)	T-7305-8	1												
52	Insulating Washer	S-10773-19	1												
53	Pivot Pin	T-9371	1												
54	Idle Roll & Arm Assembly	S-8356	1												
55	Screw, Rd. Hd.	#4-40x3/8"	8												
56	Receptacle Assembly	S-8562	1												
57	Hex Nut	#4-40	8												
58	Drive Roll	S-7981	2												
59	Drive Roll Key	T-9363	1												
60	Insulating Tube	T-9361	1												
61	Insulating Washer	S-10773-10	4												
61A	Shim	S-9262-50	As req'd												
62	Washer, Plain	S-9262-49	1												
63	Socket Hd. Screw	T-9447-9	1												
64	Stove Bolt	10-24x5"	1												
65	Mounting Angle	T-9409	2												
66	Resistor (500 ohms)	T-8280	1												
67	Hex Nut	10-24	1												
68	Hex Hd. Screw	1/4-20x1/2"	4												
69	Case Bottom Panel	M-7221	1												
70	Current Relay Current Relay Parts	M-7822 See P-47-D	1												
71	Screw, Hex Hd. Mach.	S-10787-2	2												
72	Screw, Hex Hd.	1/4-20x3/4"	1												
73	Case	L-2718	1												
74	Hex Nut	1/4-20	2												
75	Rd. Hd. Screw	1/4-20-1/2"	2												
76	Nameplate	M-7223	1												
78	Inch Button & Bushing	T-9623	1												
77	Bushing	S-8334	1												
79	Line Switch	S-7959	1												
80	Rheostat Handle	S-8158	1												
81	Cup Point Hollow Set Screw	10-24x3/16"	1												
82	Rd. Hd. Mach. Screw	10-24x5/8"	2												
83	Terminal Strip	S-8542	1												
84	Number Plate	S-10726-R	1												
85	Rheostat	S-8561	1												
86	Lead Assembly	T-9434-1	2												
87	Harness, including Connector	M-7253 S-12021-2	1												
88	Nameplate Screw	S-8025-37	4												
89	Screw, Rheostat Mounting	1/4-20x3/8"	2												
90	Screw, Switch Mtg.	6-32x1/4"	2												
91	Case Cover	L-2675	1												
92	Screw	S-8025-20	6												
93	Lead Assembly	T-9434-2	1												
94	Input Lead Clamp	T-9442	1												
95	Resistor (see Note 4)	T-9913	1												
96	Insulation	T-8212	1												
97	Protective Cover	T-9987	1												
98	Locating Collar	S-9557	1												
99	Shim	S-9262-50	As Req'd												

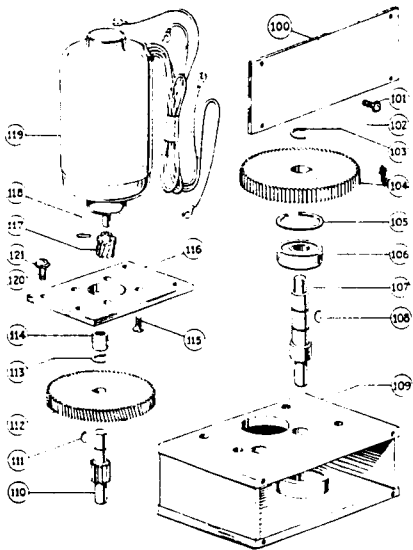
Note 4: Machines prior to Serial #556 did not include this resistor. Resistor installation kit S-9178 available for early machines.

CURRENT RELAY



ITEM	PART NAME AND DESCRIPTION	PART NO.	NO. REQ'D.
	Relay Assembly Includes:		
	Relay Back Cover - Not Illustrated	M-7822	1
	Self Tapping Screw - Back Cover to Shunt	S-9435	1
	Relay Cover - Not Illustrated	S-8025-20	2
	Self Tapping Screw - Back Cover to Cover	L-2958	1
	Relay Cover End - Not Illustrated	S-8025-20	2
	Self Tapping Screw, End to Cover	S-9436	2
	Lead Grommet - Not Illustrated	S-8025-13	4
	Relay End Cover Seal - Not Illustrated	T-9274-1	2
1	Shunt Retainer	S-9407	2
2	Shunt Insulation	S-8370	1
3	Shunt	T-10162	1
4	Moving Contact Panel	T-9339	1
5	Spring	S-9129	1
6	Panel Stationary Contact	T-9338	1
7	Adjusting Screw	S-8371	1
8	Hex Nut	T-9986	1
9	Shakeproof Washer	#10-24	4
10	Insulating Washer	T-9695-1	3
11	Insulating Tube	S-10773-14	1
12	Plain Washer	T-6675-2	1
13	Round Head Screw	S-9262-22	1
14	Lockwasher	10-24x1-1/2	1
15	Insulating Tubing	E-106-A-1	1
		T-9186-15	1

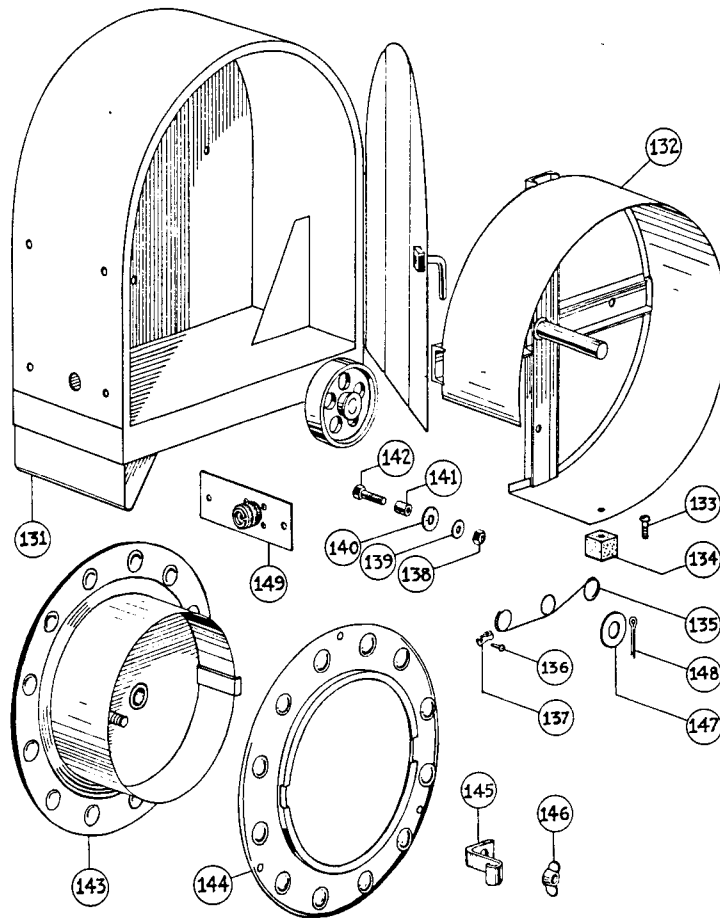
WIRE DRIVE MOTOR AND GEAR CASE



G-962-J Gear Case Assembly
supersedes G-962-A. G-962-K
Drive Motor and Gear Case
Assembly supersedes G-962.
All parts are interchangeable
except item 109. Order L-2726-2
for G-962-A Assembly.

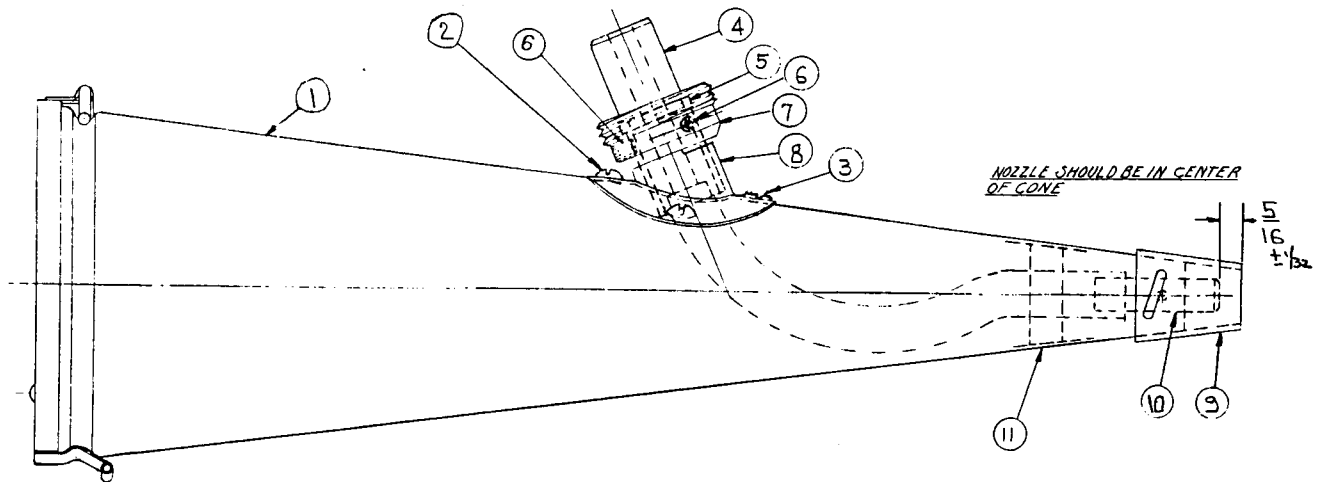
ITEM	PART NAME AND DESCRIPTION	PART NO.	NO. REQ'D.
	Drive Motor and Gear Case Assembly, Includes Items 100 Through 121:	G-962-K	
	Gear Case Assembly, Includes Items 100 Thru 114:	G-962-J	1
100	Gear Case Cover	S-8506	1
101	Lockwasher, Cover Mounting	E-106-A-1	4
102	Round Head Screw, Cover Mounting	10-24x3/8	4
103	Snap Ring, Drive Gear	T-9343	2
104	Drive Gear	S-8508	1
105	Snap Ring, Bearing	T-8857	2
106	Ball Bearing	M-9300-7	1
107	Drive Shaft	S-8509	1
108	Woodruff Key, Drive Shaft	#404	1
109	Gear Case	L-2726-3	1
110	Pinion Gear Shaft	T-9306	1
111	Woodruff Key, Pinion Gear Shaft	#304	1
112	Helical Reduction Gear	S-8507	1
113	Snap Ring, Helical Gear	T-8856	1
114	Needle Bearing	S-7844	3
	Drive Motor Assembly, (Universal) Include:	M-7647-Note 1	1
115	Flat Head Screw, Motor to Adapter Plate	8-32x5/8	4
116	Adapter Plate	S-8589	1
117	Drive Motor Pinion Gear	T-9305	1
118	Pinion Gear Pin	T-9967-15	1
119	Motor	Order M-7647	1
	Drive Motor Assembly, (Lamb Electric), Includes:	M-7691 Note 1	1
115	Flat Head Screw, Motor to Adapter Plate	10-32x1/2	4
116	Adapter Plate	S-9280	1
117	Drive Motor Pinion Gear	T-9305	1
118	Pinion Gear Pin	T-9967-15	1
119	Motor	Order M-7691	1
120	Round Head Screw, Motor to Gear Case	1/4-20x5/8	4
121	Lockwasher, Motor to Gear Case	E-106-A-2	4
	Note: 1: These two complete assemblies are interchangeable. However, when ordering parts for either assembly, give the motor serial number to insure receiving the correct part.		

WIRE REEL AND CASE



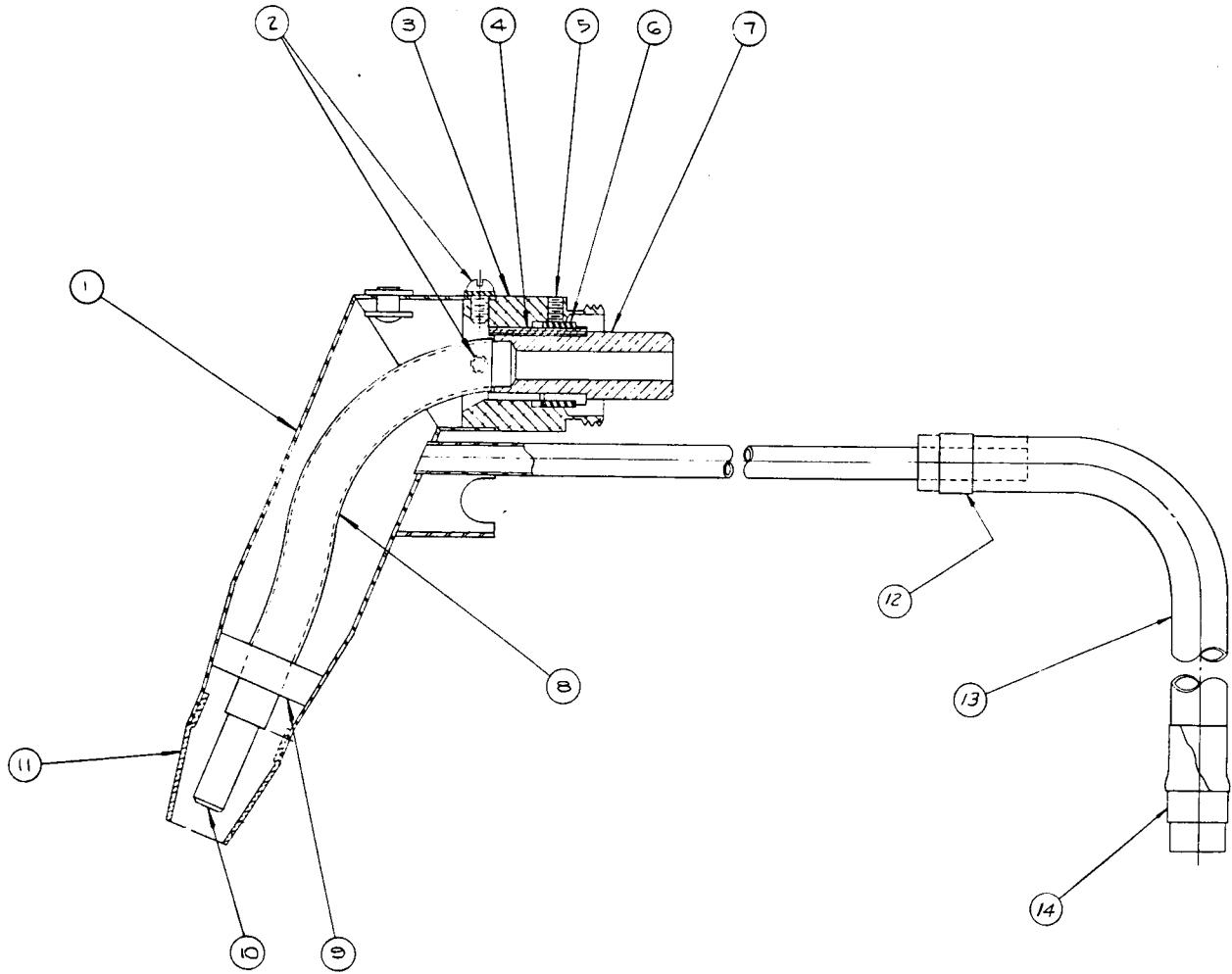
ITEM	PART NAME AND DESCRIPTION	PART NO.	NO. REQ'D.
	WIRE REEL CASE ASSEMBLY (Includes items 131-142)	G-965	1
131	Wire Reel Case	L-2755	1
132	Wire Reel Bracket Assembly	M-7244	1
133	Insulator Screw	S-8025-39	1
134	Wire Reel Bracket Insulator	T-9422	1
135	Reel Brake Spring	M-6814	1
136	Band Screw, Rd. Hd. Machine	10-24x5/16"	2
137	Spring Anchor Band	T-9421	2
138	Bracket Mounting Screw Hex Nut	3/8 - 16	4
139	Bracket Mounting Screw Washer	S-9262-4	4
140	Bracket Insulating Washer	S-10773-19	4
141	Bracket Insulating Tube	T-4476	4
142	Bracket Mounting Hex Hd. Screw	3/8-16x1 1/4"	4
	WIRE REEL ASSEMBLY (Includes items 143-146)	M-7451-1	1
143	Drum and Rear Plate Assembly	M-7450-1	1
144	Front Cover Plate	M-7447-1	1
145	Clamp	S-7446	1
146	Wing Nut	T-3960	1
147	Reel Mounting Washer	2x1 1/16x1/8"	1
148	Reel Mounting Cotter Pin	5/32 x 2"	1
149	Adapter Plate, (Wire Extension Sheath Assembly)	S-8572	1

ML-2 GUN AND CABLES



ITEM	PART NAME AND DESCRIPTION	PART NO.	NO. REQ'D.
	GUN ASSEMBLY (Includes items 1-10, see Note 1)	M-7227-5	1
1	Gun Cone and Lid Assembly	M-7226	1
2	Screw, Rd. Hd.	8-32x5/16"	3
3	Screw, Parker Kalon	S-8025-37	1
4	Nozzle Assembly	S-8564	1
5	Insulation	S-7971	1
6	Hollow Cup Point	S-11604-1	3
	Set Screw		
7	Locking Collar	T-9362	1
8	Cone Boss	M-6856	1
9	Cone Tip	S-7885	1
10	Nozzle Tip (5/64")	S-8087-5, Note 1	1
10	Nozzle Tip (3/32")	S-8087-6, Note 1	1
11	Rubber Spider	T-11049	1
	NOTE 1: Standard Gun with Nozzle tip for 5/64" wire is furnished with original equipment. Tips for 3/32" wire are available by ordering S-8087-6 or a complete gun M-7227-6.		
	THE FOLLOWING ITEMS ARE NOT ILLUSTRATED:		
	CONDUCTOR CABLE ASSEMBLY Gun to Case, includes:	L-2720	1
	Snap Ring, Case End	S-8531-1	1
	Lock Pipe, Case End	T-9416	1
	Fiber Handle, Case End	S-8530	1
	Snap Ring, Gun End	S-8531-2	1
	Locking Collar, Gun End	T-9360	1
	Fiber Handle, Gun End	S-8083	1
	Plastic Band, Gun End	T-8927-2	1
	CONTROL CABLE ASSEMBLY Generator to ML-2 Case, including:	M-7259	1
	Five Conductor Control Cable Assembly	M-7245	1
	Socket Connector	T-9429	1
	Cable Clamp for Connector	T-9411	1
	Electrode Cable Assembly (#00)	L-2286-76	1

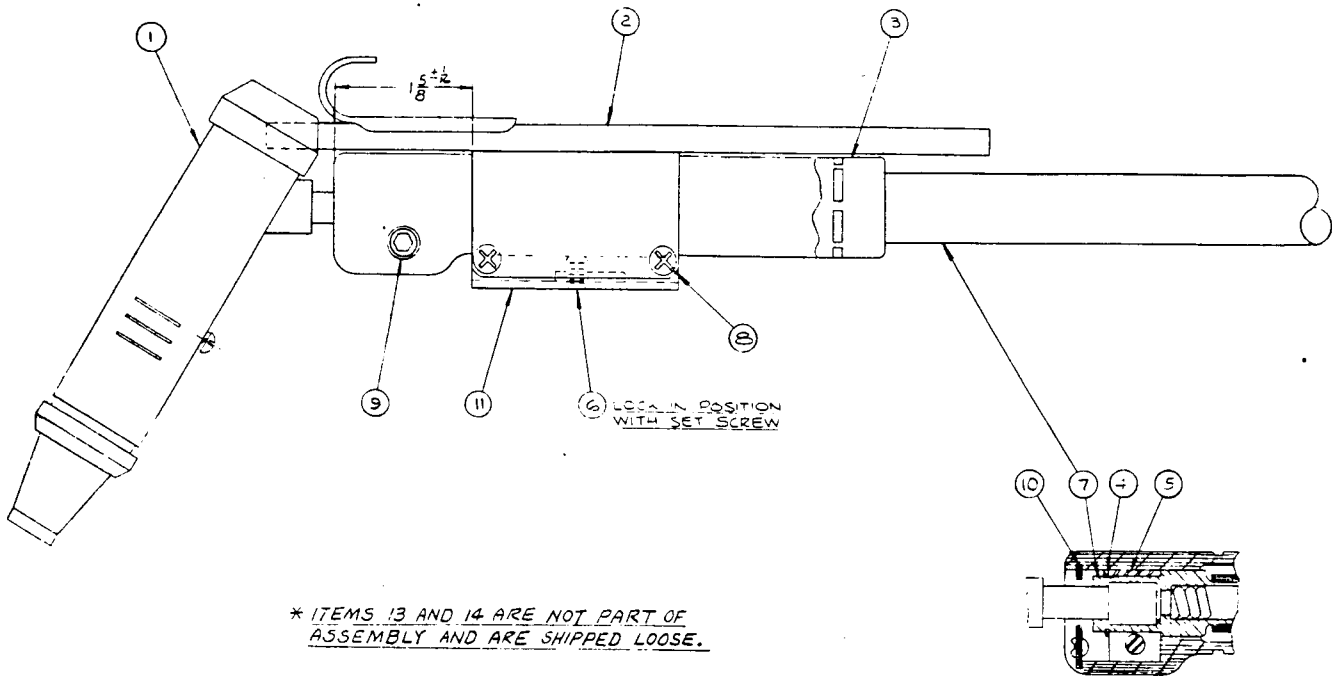
GUN



This gun assembly is no longer available. For a complete gun and cable, order Squirtgun K-133 and cable adapter S-12967.

ITEM	PART NAME AND DESCRIPTION	PART NO.	NO. REQ'D.
1	Gun Tube	M-9951	1
2	Sems Screw	T-10082-4	3
3	Locking Collar	S-12133	1
4	Clamping Insulation	S-7971	1
5	Hollow Set Screw	S-11604-1	3
6	Clamping Collar	T-11874	1
7	Nozzle Assembly	S-8564 (Note 1)	1
8	Tube Cover	T-10642-12	1
9	Flux Cone Spider	T-11049	1
10	Nozzle Tip (5/64" Electrode)	S-8087-5/64	1
11	Flux Cone, Standard (5/8" Opening)	T-11508	1
11	Flux Cone, Oversize (3/4" Opening)	T-11508-1	1
12	Hose Clamp	T-11141-2	1
13	Flux Hose	T-10642-3	1
14	Hose Clamp	S-10888-13	1
	Note 1: Should also order item 8, Tube Cover.		

K-133 GUN AND CABLE



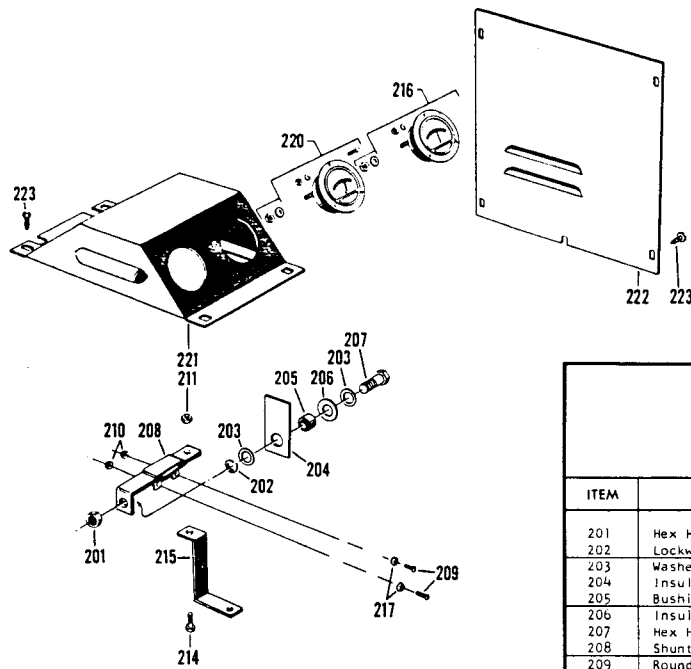
** ITEMS 13 AND 14 ARE NOT PART OF ASSEMBLY AND ARE SHIPPED LOOSE.*

SECTION THRU NOZZLE CLAMP AND CABLE CONNECTOR

TEST PER E-1760

ITEM	PART NAME & DESCRIPTION	PART NO.	NO. REQ'D	1 2 3	4 5 6
1	Gun and Cable Assembly Gun Assembly, Includes:	K-133	1		
	Cap	M-10614-2	1		
	Housing & Nozzle Assembly, Includes:				
	Nozzle	M-10670-2	1		
	Housing	S-13001-2	1		
	Collar	S-13486-2	1		
	Flux Cone	S-12964-1	1		
	Flux Cone	S-12957-5/8	1		
	Contact Tip	S-12957-3/4	1		
2	Clamp and Tube Assembly	T-12011-5/64	2		
3	Handle	S-12962	1		
4	Retaining Ring	M-10102	1		
5	Clamp	S-9776-7	1		
6	Hollow Set Screw	S-11598-1	1		
7	Cable Assembly, Includes:	S-11604-8	1		
	Handle and Stiffener, Wire Feeder End	L-4230-7	1		
	Connector, Wire Feeder End	S-13111	1		
	Connector, Gun End	S-12801-6	1		
	Clamping Tube, Both Ends	S-12802-6	1		
		S-7748-40	2		
8	Thread Cutting Screw	S-9225-19	4		
9	Socket Head Cap Screw	T-9447-9	1		
10	Spatter Shield	T-12027	1		
11	Clamp Retainer Assembly	T-12601	1		

METER KIT (K-51 and Accessory - M)



This Continuous Flux Feed kit is no longer available. The LN-5 kit (K-121) can be used with the ML-2.

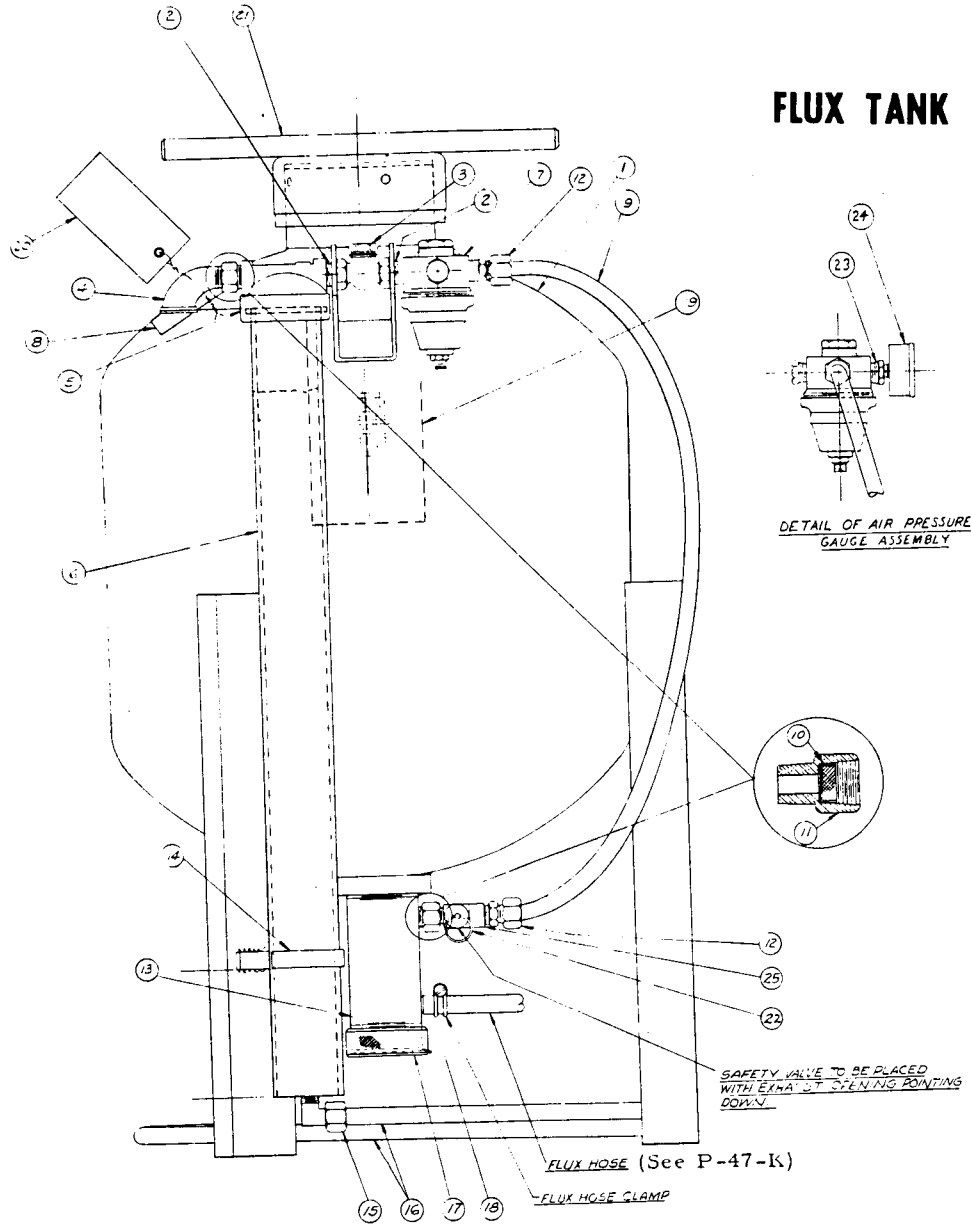
ITEM	PART NAME AND DESCRIPTION	PART NO.	NO. REQ'D.
201	Hex Head Nut, C.P.	1/2-13	1
202	Lockwasher	E-106-A-5	1
203	Washer	S-9262-1	2
204	Insulation	T-10089	1
205	Bushing	T-4122	1
206	Insulating Washer	S-10773-9	1
207	Hex Head Bolt, C.P.	1/2-13x1-1/2"	1
208	Shunt	S-6602-1	1
209	Round Head Machine Screw, C.P.	#10-24x3/8"	2
210	Hex Head Nut, C.P.	#10-24	2
211	Hex Head Nut, C.P.	1/2 - 13	1
214	Hex Head Bolt, C.P.	1/2-13x3/4"	1
215	Jumper	T-10466	1
216	Ammeter	S-5177-8	1
217	Lockwasher	E-106-A-1	2
220	Voltmeter	S-5495-4	1
221	Top Cover	M-8136	1
222	Side Cover	S-9961	1
223	Slotted Head Screw	S-8025-20	8
	Meter Guard	S-11455	1

P-47-J

EXTENSION ASSEMBLIES - K-49 & K-50

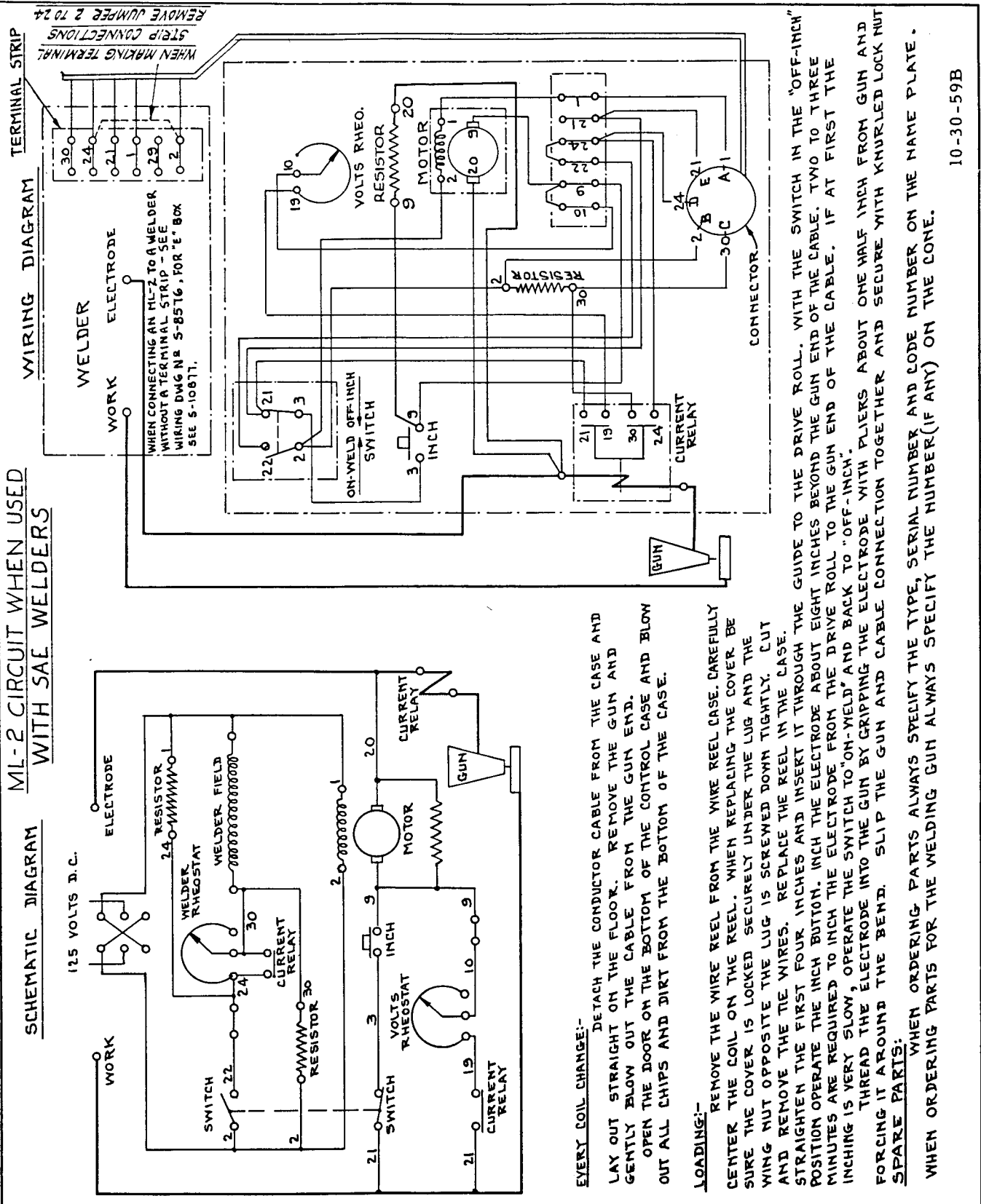
ITEM	PART NAME AND DESCRIPTION	PART NO.	NO. REQ'D.
	CONTROL CABLE EXTENSION, 50 feet	K-50	1
	Cable Clamp for Connector	T-9411	2
	Socket Connector	T-9429	1
	Pin Connector	T-9430	1
	Five Conductor Cable	M-7249-1	1
	WIRE EXTENSION SHEATH ASSEMBLY, includes;	K-49	1
	Extension Sheath Assembly	M-7231	1
	Cable Clamp for Connectors	T-9411	2
	Connector, to control case	T-9412	1
	Connector, to adapter plate	T-9413	1
	Reinforcing Sleeve	S-9018	2
	Adapter Plate Assembly. (Item #149, P-47-F)	S-8572	1
	Plate	S-8563	1
	Connector	T-9415	1
	Insulation Tube	T-9359	1
	Spring	T-9367-3	1
	Nozzle	T-9367-3	1

CONTINUOUS FLUX FEED KIT : K-84

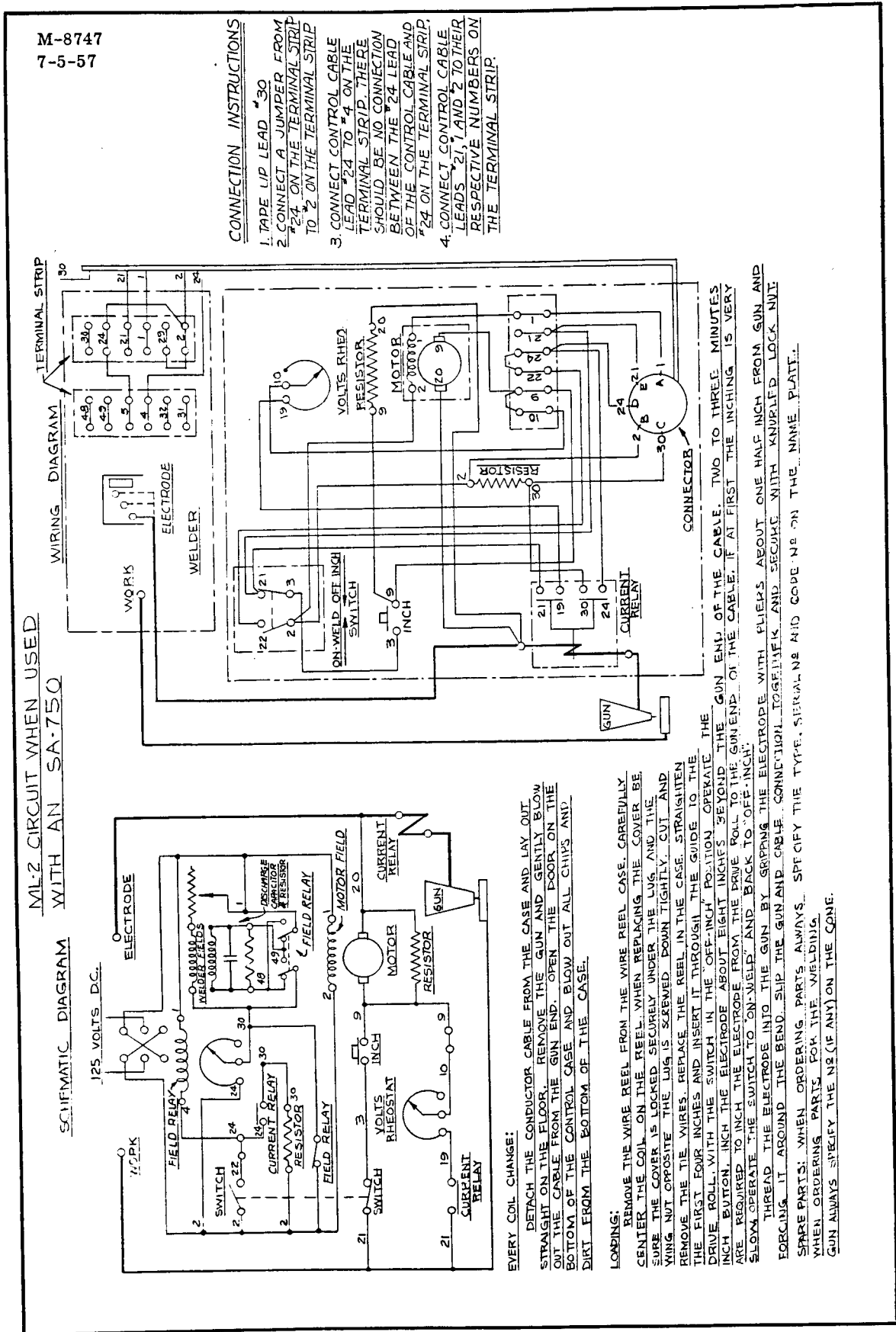


ITEM	PART NAME AND DESCRIPTION	PART NO.	NO. REQ'D.
	This Continuous Flux Feed Kit is no longer available. Order L-4695-1 if a complete kit or tank is needed.		
2	Close Nipple	T-9959-7	2
3	Check Valve	T-11130	2
4	Street Ell	T-9958-2	1
5	Air Line Filter	S-11060	1
6	Water Separator	M-8985	1
7	Pressure Regulator	S-11028	1
8	Decal	T-11182	1
9	Copper Line	S-4893-61	1
10	Screen Cup	T-11249	2
11	Adapter	T-11248	2
12	Male Connector	T-11167	2
13	Outlet Assembly	S-11157	1
14	Bracket	T-11152	1
15	Compression Elbow	S-7531	1
16	Copper Line	T-11170	1
17	Outlet Tube Cap	S-11155	1
18	Gasket	T-11225-1	1
19	Strainer	S-11154	1
20	Caution Tag	S-11461	1
21	Tank Cover (Includes Cover Gasket)	S-11461	1
	Cover Gasket	T-11424-1	1
22	Safety Valve	T-11394	1
23	Reducing Bushing	T-9948	1
24	Air Pressure Gauge	S-11395	1
25	Street Tee	T-11393	1
	Magnetic Separator (Accessory)	S-11448	1

ML-2 CIRCUIT WHEN CONNECTED TO AN SAE-600



ML-2 CIRCUIT WHEN CONNECTED TO AN SA-750



SAFETY PRECAUTIONS

For your own protection read and observe all instructions and specific safety precautions included in this manual as well as the following general safety precautions.

1. Protect yourself from electrical shock:
 - a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Avoid contact between "hot" parts of the circuits and bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
 - b. Take special care to insulate yourself from ground using dry insulation when welding in damp locations, on metal floors, gratings or scaffolds, and in positions (such as sitting or lying) where large areas of your body can be in contact with possible grounds.
 - c. Maintain the automatic welding nozzle, semiautomatic welding gun, ground clamp, welding cable and welding machine in good, safe operating condition.
 - d. Never dip a semiautomatic welding gun in water for cooling.
 - e. Do not simultaneously touch electrically "hot" parts of electrodes, nozzles or guns connected to two different welders because the voltage between the two can be the total of the open circuit voltage of both welders.
2. When working above floor level, protect yourself from a fall should you get a shock. Never wrap the gun cable around any part of your body.
3. Arcburn may be more severe than sunburn. Therefore:
 - a. Use a good shield fitted with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding.
 - b. Use suitable clothing to protect your skin and that of your helpers from the arc rays.
 - c. Protect other nearby personnel with suitable non-flammable screening.
4. Droplets of molten slag and metal are thrown or fall from the welding arc. Protect yourself with oil free protective garments such as leather gloves, heavy shirt, cuffless trousers and high shoes.
5. Always wear safety glasses when in a welding area. Use glasses with side shields when near slag chipping operations.
6. Remove flammable material from the area or cover it to prevent the welding sparks from starting a fire.
7. When not welding, place the holder where it is insulated from the ground system. Accidental grounding can cause overheating and create a fire hazard.
8. Be sure the work cable is connected to the work as close to the welding area as practical. Work cables connected to the building framework or other locations some distance from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazard or overheat lifting chains or cables until they fail.
9. Be sure the frame of the power source and welding fixtures are grounded.
10. Provide adequate ventilation in the welding area. This is particularly important when welding on galvanized, lead or cadmium plated steel and other metals which produce toxic fumes.
11. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat or the rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
12. Turn the power source off before doing any troubleshooting or electrical maintenance work inside the wire feeder.
13. For more detailed safety information, purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" for \$4.00 from the American Welding Society.

HOW TO ORDER REPLACEMENT PARTS

Order parts only from Lincoln offices or from the Authorized Field Service Shops listed in the "Service Directory". Give the following information:

- (a) From the nameplate - machine model code and serial numbers.
- (b) From this manual - part name, item number, quantity required and

the number of the list used to get this information.

Any items indented in the "Parts Name" column are included in the assembly under which they are listed. The indented items may be ordered separately. If the entire assembly is needed, do *not* order the indented parts.

WARRANTY SUPPLEMENT

GUARANTEE

The Lincoln Electric Company, the Seller, warrants new equipment except engines and accessories thereof against defects in workmanship and material for a period of one year from date of shipment, provided the equipment has been properly cared for, and operated under normal conditions. Engines and engine accessories are warranted free from defects for a period of ninety days from the date of shipment.

If the Buyer gives the Seller written notice of any defects in equipment, electrode or flux within any period of warranty and the Seller's inspection confirms the existence of such defects, then the Seller shall correct the defect or defects at its option, either by repair or replacement F.O.B. its own factory or other place as designated by the Seller. The remedy provided Buyer herein for breach of Seller's warranty shall be exclusive.

No expense, liability or responsibility will be assumed by the Seller for

repairs made outside of the Seller's factory without written authority from the Seller.

The Seller shall not be liable for any consequential damages in case of any failure to meet the conditions of any warranty. The liability of the Seller arising out of the supplying of said equipment or electrode or its use by the Buyer, whether on warranties or otherwise, shall not in any case exceed the cost of correcting defects in the equipment or replacing defective electrode in accordance with the above guarantee. Upon the expiration of any period of warranty, all such liability shall terminate.

The foregoing guarantees and remedies are exclusive and except as above set forth there are no guarantees or warranties with respect to engines, accessories, equipment or electrodes, either express or arising by operation of law or trade usage or otherwise implied, including without limitation the warranty of merchantability, all such warranties being waived by the Buyer.



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